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Domestic Residue Data Book National Residue Program 1993

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FOOD SAFETY AND INSPECTION SERVICE

**DOMESTIC RESIDUE DATA BOOK
NATIONAL RESIDUE PROGRAM
1993**

**FOOD SAFETY AND INSPECTION SERVICE
1993 NATIONAL RESIDUE PROGRAM
DOMESTIC RESIDUE DATA BOOK**

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INTRODUCTION

INTRODUCTION

The Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA) is responsible for ensuring that USDA-inspected meat and poultry products are safe, wholesome, free of adulterating residues, and accurately labeled. As part of this responsibility, FSIS conducts the National Residue Program (NRP) to help prevent the marketing of animals containing unacceptable (violative) residues from pesticides, animal drugs, or potentially hazardous chemicals. The NRP collects samples of meat and poultry products at domestic slaughter establishments under FSIS and State inspection authority. These samples are then analyzed for violative residue concentrations, either by one of the three FSIS technical service laboratories or by a laboratory under contract to FSIS. Violative residue concentrations - violations - are determined by reference to residue limits (tolerances or action levels) established for pesticides by the Environmental Protection Agency (EPA) and for animal drugs and environmental contaminants by the Food and Drug Administration (FDA).

The activities pursued by the NRP in 1993 were divided into two categories: monitoring and individual enforcement testing.

Monitoring

Monitoring is designed to provide information on the occurrence of residue violations in specified animal populations on an annual, national basis. Because the primary concern of monitoring is violations, generally compounds with established limits - tolerances or action levels - are considered. Residue limits pertinent to the 1993 NRP are listed in Appendix I. In some cases compounds without established limits will be included in monitoring; only those compounds that are a public health concern and are not legally approved for any use in food animals would be included. Selection for monitoring is based on compound evaluations and the availability of laboratory methodology that is suitable for regulatory purposes. It should also be borne in mind that multi-residue tests may detect some compounds that have tolerances but have little public health significance. See FSIS publication Compound Evaluation and Analytical Capability/National Residue Program Plan [CEAC/NRPP], 1993 edition.

Monitoring information is obtained through a statistically-based selection of random samples from healthy-appearing animals under inspection. Monitoring is not designed to estimate the actual percentage of violations in the national population. Rather, the number of samples chosen in the annual plan for a given compound-species combination is intended to detect a national problem that affects a specified percentage of the animal population of interest. The sample sizes that are most often used provide a 95 percent probability of detecting at least one violation when one percent of the animal population

sampled is violative (see Table on page 16). Exceptions are made for minor species and for major species in which problems are suspected; smaller sample sizes may be used in the former case, larger sample sizes in the latter.

The information generated from monitoring is reviewed periodically to assist in the allocation of Agency resources. 39,128 monitoring sample units were analyzed during 1993 from all classes of food-producing animals.

Individual Enforcement Testing

Individual enforcement testing consists of the analysis of specimens obtained from individual animals or lots based on clinical signs or herd history. Testing is performed to detect individual animals with violative concentrations of residues. It is emphasized in problem (high prevalence) populations and is used as a tool to prevent residues from entering the food supply. Testing frequently results from decisions by FSIS inspectors based on regional guidelines and direct observations. It is also used to follow up on producers and others who have been identified as marketing animals with violative concentrations of residues. 344,782 individual enforcement testing samples were analyzed in 1993.

Multi-Residue Tests

Multi-residue tests are used for several compound classes. These tests may detect compounds other than those of significant concern for the NRP. If such compounds have pertinent residue limits, they are included here.

In-Plant Tests

In-plant tests are a key part of the NRP.

SOS, for Sulfa-On-Site, was implemented in April 1988 to test swine urine for sulfonamide residues. SOS is used in many of the largest swine slaughtering facilities. Laboratory confirmation of violations is required.

CAST, for Calf Antibiotic and Sulfonamide Test, is used to test bob veal calves (under 150 pounds and less than three weeks old). CAST does not require laboratory confirmation of the result; any violation found with CAST results in immediate condemnation of the calf.

STOP, for Swab Test on Premises, was implemented in 1979 to detect the presence of antibiotic residues in kidney tissue. Originally for testing dairy cows, it is now used for a number of species. Laboratory confirmation is required before the animal carcass is condemned. Certain STOP-positive samples are tested for both antibiotics and sulfonamides; the sulfonamide violations are reported with the STOP antibiotic violations.

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Confirmed STOP positive sample specimens with sulfonamide residues that have no established limits are considered violative in those slaughter classes in which they are not approved for use.

FAST, for Fast Antimicrobial Screen Test, quickly detects both antibiotic and sulfonamide drug residues in kidneys and livers and has proved to be a suitable replacement for CAST and STOP. FAST was implemented in pilot plants in 1993.

Sample Analyses/Violations

The reader reviewing the 1993 Residue Data Book is cautioned against equating total residue violations with total sample units that are violative. For example, tissue from one animal analyzed by the Chlorinated Hydrocarbons and Organophosphates screening method may contain two or more violative residues.

It should also be noted that many sample tissues are analyzed for more than one compound or compound class and are reported here as separate analyses or violations. Each will be reported and included in total residue findings, even though occurring in the same animal.

In this format, the main entries under compound or compound-class headings refer to sample analyses; the "Specific Violative Residues" presented in smaller type refer to the actual residues found. In addition, analytical capabilities should be considered when interpreting residue levels and occurrences; see the 1993 edition of the CEAC/NRPP, Section 3, "FSIS Residue Analytical Capability."

A Note on Calf Nomenclature

This edition follows the usage of the 1989 and later editions of the CEAC/NRPP. What was called "Fancy calves" in the 1988 edition became "Formula-fed calves" in 1989; what was called "Western calves" in 1988 became "Heavy calves" in 1989.

Non-Violative Positive Results

Appendix II displays, for monitoring and individual enforcement testing (excluding CAST), those laboratory-confirmed residues that are within established limits. The results include some Unidentified Microbial Inhibitors (UMI's), residues from antibacterial agents that cannot be accurately identified but are nevertheless present.

Voluntary Inspection Program

A voluntary inspection and certification program is maintained for rabbits; results from 1993 are presented here in Appendix III.

Summary of 1993 Results

The percentage of violative monitoring samples remains low. FSIS data indicate that the great majority of the 129.8 million head of livestock and seven billion birds are free of violative residues when they enter federally inspected plants.

In 1993 the FSIS monitoring program sampled and tested for eight classes of animal drug and pesticide compounds, comprising forty-two residues. Of the 39,128 monitoring samples 0.26 percent showed violative concentrations of residues, comparable to 0.29 percent in the 1992 samples and 0.26 percent in the 1991 samples.

The majority of the violations detected in monitoring were from illegal levels of approved animal drugs, particularly sulfonamide and antibiotic compounds used to prevent or treat bacterial infections. Most antibiotic and sulfonamide residue violations are confined to a relatively small percentage of livestock that make up the meat supply. These same data show few residues in poultry. The recurring reason for drug residue violations in livestock (and poultry, in past years) is failure to allow adequate time for the drugs to clear the animal's system. Detected illegal residues are usually concentrated in kidney, liver, or fat rather than muscle meat. NRP monitoring focuses on kidney and liver tissues, since most FDA limits are set in terms of these tissues.

In 1993 monitoring 12 ivermectin violations were found, 10 chlorinated hydrocarbon and chlorinated organophosphate, three levamisole, two arsenic, and one halofuginone.

Specific National Residue Program Compounds/Classes

Antibiotics

Forty-two antibiotic monitoring violations were found among 8,274 samples from all slaughter classes monitored for antibiotics. Thus, 0.51 percent of the samples tested for antibiotics were found to be violative in 1993 compared to 0.42 percent in 1992 and 0.86 percent in 1991. Bob veal calf samples in 1993 monitoring slightly increased in violations to 1.8 percent from 1.4 percent in 1992. CAST analyses performed on bob veal calves decreased from 111,833 in 1992 to 65,590 in 1993, due to a decrease in the number of bob veal calves presented for slaughter. In 1993 there were 1,084 violative specimens in the 65,590 CAST samples tested. The percentage of samples tested and found violative by the CAST test dropped from 1.8 percent in 1992 to 1.65 percent in 1993.

STOP testing in 1993 for horses, cattle, sheep/lambs, goats, and swine resulted in 1,835 violations among 121,043 sample analyses.

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Sulfonamides

The percentage of violative monitoring samples for sulfonamides declined slightly in 1993 to 0.4 percent from 0.6 percent in 1992.

157,366 SOS tests produced 168 violative samples in 1993 (0.11 percent of sample analyses).

Arsenic

Arsenical compounds are used in food-producing animals primarily as growth promoters and to prevent bacterial enteritis. The 2,011 monitoring samples taken from livestock and poultry showed only two violations, both in young chickens.

Chlorinated Hydrocarbons & Organophosphates

These chemicals are effective insecticides. Some of these compounds - such as DDT - are no longer marketed because of their extremely long half-life. Ten violative analyses were found in sample specimens from horses, steers, heavy calves, sheep, goats, and boars/stags. PCB's accounted for three of the ten violative residues.

Halofuginone

Halofuginone prevents coccidiosis, a serious and potentially fatal parasitic infection that spreads rapidly among chickens and turkeys. Of 632 young turkeys and young chickens sampled in 1993, only one violation in young chickens was recorded.

Ivermectin

Ivermectin is the most widely sold animal drug in the United States; it is active against a wide variety of parasites. Twelve of 3,679 samples in 1993 monitoring were violative: four in non-formula calves, three in heavy calves, two in goats, one in a steer, one in a formula-fed calf, and one in a sheep. No violations were found among samples from six other production classes.

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Levamisole

Levamisole is a broad-spectrum anthelmintic that is active against the mature stages of the major gastrointestinal helminths and against mature and immature lung worms. It is approved for use in swine, non-lactating dairy cattle, and beef cattle. Withdrawal times vary from two to nineteen days before slaughter depending on the species and dosage regimen. Of the 4,168 samples tested in the 1993 monitoring program, two violations were found in mature sheep and one violation was found in market hogs.

Morantel Tartrate

Morantel tartrate is a broad-spectrum anthelmintic used for the removal and control of mature gastrointestinal nematode infections. It is approved for use in dairy and beef cattle. The high use of morantel tartrate in dairy cattle was a major factor for including this compound in the plan. Of the 2,547 monitoring samples, no violations were found in any of the eight production classes tested.

Comments:

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Please contact the Residue Planning Branch for responses to scientific questions about the residue program. The telephone number is 202-205-0007.

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1993 DOMESTIC RESIDUE PROGRAM RESULTS

1993 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS

Chlortetracycline	Neomycin	Streptomycins
Erythromycin	Oxytetracycline	Tetracycline
Gentamicin	Penicillins	Tylosin

Species or Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
--	--	--

(Non-violative positives are reported in Appendix II)

Horses	309/12	19/0
Bulls	350/0	
Beef cows	671/1	
Dairy cows	260/4	
Heifers	344/0	
Steers	333/0	
Bob calves	489/9	
Formula-fed calves	537/1	
Non-formula calves	303/3	
Heavy calves	308/1	
Cattle	--	79/9
Sheep	291/1	
Lambs	351/2	
Sheep/Lambs	--	10/0
Goats	318/0	9/0
Market hogs	322/1	
Boars/Stags	444/0	
Sows	532/1	
Swine	--	36/3

1993 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS, continued

Species or Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
Young chickens	489/0	
Mature chickens	498/0	
Chickens	--	22/0
Young turkeys	520/3	
Mature turkeys	246/2	
Turkeys	--	22/0
Ducks	356/1	10/0
Geese	3/0	
TOTAL	8,274/42	207/12

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

Horses: 10 streptomycin, 2 penicillin

Beef cows: 1 erythromycin

Dairy cows: 3 gentamicin, 1 penicillin, 1 tetracycline, 1 neomycin

Bob calves: 5 neomycin, 3 penicillin, 3 gentamicin

Formula-fed calves: 1 tetracycline

Non-formula calves: 2 penicillin, 1 streptomycin, 1 erythromycin,
1 neomycin

Heavy calves: 1 oxytetracycline

Sheep: 1 penicillin, 1 streptomycin

Lambs: 2 tetracycline

Market hogs: 1 penicillin

Sows: 1 penicillin

Young turkeys: 1 penicillin, 1 tetracycline, 1 chlortetracycline

Mature turkeys: 2 tetracycline

1993 DOMESTIC RESIDUE PROGRAM RESULTS

ANTIBIOTICS, continued

Ducks: 1 chlortetracycline

Individual Enforcement Testing:

Cattle: 4 penicillin, 3 oxytetracycline, 2 gentamicin, 2 neomycin,
2 chlortetracycline, 2 tetracycline

Swine: 3 tetracycline, 2 streptomycin, 1 oxytetracycline

In-plant Tests

Individual Enforcement Testing: Analyses/Violations

Calf Antibiotic and Sulfonamides Test (CAST)

65,590/1,084

Swab Test On Premises (STOP)

[Includes samples tested for sulfonamides also]

Horses

795/25

Cattle

112,809/1,765

Sheep/Lambs

1,656/2

Goats

119/0

Swine

5,664/43

TOTAL STOP

121,043/1,835

STOP SPECIFIC VIOLATIVE RESIDUES

Horses: 19 penicillin, 8 streptomycin, 6 sulfadimethoxine,
4 oxytetracycline, 2 gentamicin

Cattle: 1,053 penicillin, 635 oxytetracycline, 377 streptomycin, 194 tetracycline,
166 sulfamethazine, 144 gentamicin, 100 sulfadimethoxine, 87 neomycin,
58 erythromycin, 53 chlortetracycline, 3 sulfathiazole, 2 tylosin,
2 sulfachloropyrazine, 2 sulfapyridine, 2 sulfachloropyridazine, 1 sulfadoxine

Sheep/Lambs: 1 streptomycin, 1 penicillin

Swine: 17 penicillin, 12 tetracycline, 10 streptomycin, 8 sulfamethazine,
4 oxytetracycline, 4 sulfathiazole

1993 DOMESTIC RESIDUE PROGRAM RESULTS

SULFONAMIDES

Sulfachlorpyridazine

Sulfamethazine

Sulfadimethoxine

Sulfathiazole

Species or Production Class

Monitoring: Analyses/Violations

Individual Enforcement Testing: Analyses/Violations

(Non-violative positives are reported in Appendix II)

Horses	306/2	2/2
Bulls	350/0	
Beef cows	672/1	
Dairy cows	261/3	
Heifers	348/0	
Steers	338/0	
Bob calves	489/7	
Formula-fed calves	537/1	
Non-formula calves	300/2	
Heavy calves	309/2	
Cattle	--	47/24
Sheep	292/0	
Lambs	351/0	
Sheep/Lambs	--	
Goats	317/1	5/1
Market hogs	322/0	
Boars/Stags	442/7	
Sows	532/3	
Swine	--	195/60
Young chickens	487/0	
Mature chickens	491/0	
Chickens	--	3/0

1993 DOMESTIC RESIDUE PROGRAM RESULTS

SULFONAMIDES, continued

Species or Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
Young turkeys	524/1	
Mature turkeys	243/2	
Turkeys	--	19/3
Ducks	353/0	3/0
Geese	3/0	
TOTAL	8,267/32	274/90

SPECIFIC VIOLATIVE RESIDUES

Monitoring:

Horses: 2 sulfamethazine, 1 sulfadimethoxine
Beef cows: 1 sulfadoxine
Dairy cows: 3 sulfadimethoxine
Bob calves: 5 sulfamethazine, 2 sulfadimethoxine
Formula-fed calves: 1 sulfamethazine
Non-formula calves: 1 sulfadimethoxine, 1 sulfamethazine
Heavy calves: 2 sulfamethazine
Goats: 1 sulfamethazine
Boars/Stags: 6 sulfamethazine, 1 sulfathiazole
Sows: 2 sulfamethazine, 1 sulfathiazole
Young turkeys: 1 sulfaquinoxaline
Mature turkeys: 2 sulfadimethoxine

Individual Enforcement Testing:

Horses: 2 sulfamethazine, 1 sulfadimethoxine
Cattle: 25 sulfadimethoxine, 18 sulfamethazine, 9 sulfathiazole,
1 sulfadoxine
Goats: 1 sulfamethazine
Swine: 76 sulfamethazine, 2 sulfathiazole, 1 sulfadimethoxine
Turkeys: 2 sulfaquinoxaline, 1 sulfadimethoxine

1993 DOMESTIC RESIDUE PROGRAM RESULTS

SULFA-ON-SITE (SOS)

Individual Enforcement Testing: Analyses/Violations

Market hogs

157,366/168

All residues are of sulfamethazine in muscle tissue

ARSENIC

Species or Production Class

Monitoring: Analyses/Violations

Individual Enforcement Testing: Analyses/Violations

(Non-violative positives are reported in Appendix II)

Goats

26/0

Market hogs

319/0

Boars/Stags

263/0

Sows

328/0

Swine

--

4/0

Young chickens

305/2

Mature chickens

306/0

Chickens

--

23/0

Young turkeys

312/0

Mature turkeys

152/0

Turkeys

--

1/0

TOTAL

2,011/2

28/0

1993 DOMESTIC RESIDUE PROGRAM RESULTS

CHLORINATED HYDROCARBONS & ORGANOPHOSPHATES (CHC/COP'S)

Aldrin	Chlorpyrifos	Endrin
Benzene Hexachloride (BHC)	Coumaphos and	Heptachlor and
Carbophenothion (trithion)	oxygen analog	heptachlor epoxide
Chlordane (technical)	DDT and	Hexachlorobenzene (HCB)
2-Chloro-1-(2,4,-	metabolites	Lindane
dichlorophenyl)vinyl	Dieldrin	Linuron
diethyl phosphate	Dodecachlorooctahydro-	Methoxychlor
[chlorfenvinphos, supona]	1,3,4-metheno-2H-	Phosalone
2-Chloro-2,4,5-	cyclobuta(cd)pentalene	Polybrominated biphenyls (PBB's)
trichlorophenyl) vinyl	[mirex]	Polychlorinated biphenyls (PCB's)
dimethyl phosphate	Endosulfan	Ronnel
[stirofos, gardona]		

Species or Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
--	--	--

(Non-violative positives are reported in Appendix II)

Horses	425/3	81/11
Bulls	555/0	
Beef cows	651/0	
Dairy cows	272/0	
Heifers	546/0	
Steers	523/1	
Formula-fed calves	529/0	
Non-formula calves	458/0	
Heavy calves	498/1	
Cattle	--	57/0
Sheep	470/1	
Lambs	574/0	
Sheep/Lambs	--	7/0

1993 DOMESTIC RESIDUE PROGRAM RESULTS

CHC/COP'S, continued

Species or Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
Goats	533/3	14/0
Market hogs	499/0	
Boars/Stags	452/1	
Sows	537/0	
Swine	--	28/2
Young chickens	498/0	
Mature chickens	458/0	
Chickens	--	11/0
Young turkeys	519/0	
Mature turkeys	228/0	
Turkeys	--	
Ducks	322/0	
Geese	3/0	18/0
TOTAL	9,550/10	216/13

Specific Violative Residues

Monitoring:

Horses: 1 coumaphos, 1 dieldrin, 1 PCB

Steers: 1 heptachlor

Heavy calves: 1 mirex

Sheep: 1 PCB

Goats: 1 chlordane, 1 PBB, 1 PCB

Boars/Stags: 1 DDT

1993 DOMESTIC RESIDUE PROGRAM RESULTS

CHC/COP'S, continued

Individual Enforcement Testing:

Horses: 11 coumaphos

Market hogs: 2 dieldrin, 2 DDT, 2 heptachlor,
2 lindane

HALOFUGINONE

Species or Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
--------------------------------	------------------------------------	---

(Non-violative positives are reported in Appendix II)

Young chickens	311/1	
Chickens	--	20/0
Young turkeys	321/0	
TOTAL	632/1	20/0

IVERMECTIN

Species or Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
--------------------------------	------------------------------------	---

(Non-violative positives are reported in Appendix II)

Beef cows	405/0
Dairy cows	161/0
Heifers	339/0
Steers	332/1
Formula-fed calves	338/1
Non-formula calves	289/4

1993 DOMESTIC RESIDUE PROGRAM RESULTS

IVERMECTIN, continued

Species or Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
Heavy calves	312/3	
Cattle	--	13/1
Sheep/Lambs	282/1	
Goats	312/2	1/0
Market hogs	318/0	
Boars/Stags	267/0	
Sows	324/0	
Swine	--	1/0
TOTAL	3,679/12	15/1

LEVAMISOLE

Species or Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
--	--	--

(Non-violative positives are reported in Appendix II)

Bulls	354/0	
Beef cows	406/0	
Dairy cows	177/0	
Heifers	335/0	
Steers	340/0	
Formula-fed calves	343/0	
Heavy calves	305/0	
Cattle		1/1

1993 DOMESTIC RESIDUE PROGRAM RESULTS

LEVAMISOLE, continued

Species or Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
Sheep	304/2	
Lambs	361/0	
Goats	308/0	
Market hogs	328/1	
Boars/Stags	268/0	
Sows	339/0	
TOTAL	4,168/3	1/1

MELENGESTROL ACETATE (MGA)

Species or Production Class	Individual Enforcement Testing: Analyses/Violations
--	--

(Non-violative positives are reported in Appendix II)

Cattle	19/0
Sheep/Lambs	3/0
TOTAL	22/0

1993 DOMESTIC RESIDUE PROGRAM RESULTS

MORANTEL TARTRATE

Species or Production Class	Monitoring: Analyses/Violations
--------------------------------	------------------------------------

(Non-violative positives are reported in Appendix II)

Bulls	362/0
Beef cows	406/0
Dairy cows	163/0
Steers	331/0
Heifers	340/0
Formula-fed calves	343/0
Non-formula calves	290/0
Heavy calves	312/0
 TOTAL	 2,547/0

1993 DOMESTIC RESIDUE PROGRAM RESULTS

CUMULATIVE TOTAL

Species/ Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
Horses	1,040/17	897/38
Bulls	1,971/0	
Beef cows	3,211/2	
Dairy cows	1,294/7	
Heifers	2,252/0	
Steers	2,197/2	
Bob calves	978/16	
Formula-fed calves	2,627/3	
Non-formula calves	1,640/9	
Heavy calves	2,044/7	
Cattle	--	178,615/2,884
Sheep	1,639/5	
Lambs	1,637/2	
Sheep/Lambs	--	1,676/2
Goats	1,814/6	148/1
Market hogs	2,108/2	
Boars/Stags	2,136/8	
Sows	2,592/4	
Swine	--	163,294/276
Young chickens	2,090/3	
Mature chickens	1,753/0	
Chickens	--	79/0
Young turkeys	2,196/4	
Mature turkeys	869/4	
Turkeys	--	42/3

1993 DOMESTIC RESIDUE PROGRAM RESULTS

CUMULATIVE TOTAL , continued

Species/ Production Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
Ducks	1,031/1	13/0
Geese	9/0	18/0
TOTAL	39,128/102	344,782/3,204

1993 DOMESTIC RESIDUE PROGRAM RESULTS

CUMULATIVE TOTAL

Residue Class	Monitoring: Analyses/Violations	Individual Enforcement Testing: Analyses/Violations
Antibiotics	8,274/42	186,840/2,931 ¹
Sulfonamides	8,267/32	157,640/258 ²
Arsenic	2,011/2	28/0
CHC/COP's	9,550/10	216/13
Halofuginone	632/1	20/0
Ivermectin	3,679/12	15/1
Levamisole	4,168/3	1/1
Melengestrol acetate	--	22/0
Morantel tartrate	2,547/0	--
TOTAL	39,128/102	344,782/3,204

1. Includes CAST and STOP data.

2. Includes SOS data.

1993 DOMESTIC RESIDUE PROGRAM RESULTS

TABLE: Number of Samples Required to Ensure Detection of a Problem that Affects a Given Percentage of the Sampled Population

Percentage Violative in Sampled Population	Probability of Detection (Percent)			
	90	95	99	99.9
	Samples Required			
10	22	29	44	66
5	45	59	90	135
1	230	299	459	688
0.5	460	598	919	1,379
0.1	2,302	2,995	4,603	6,905
0.05	4,605	5,990	9,209	13,813

APPENDIX I

APPENDIX I: 1993 RESIDUE LIMITS

This section provides information on residue limits in meat and poultry products applied by FSIS (as of July 1, 1993). These limits include tolerances and action levels developed by the Environmental Protection Agency (EPA) for pesticide chemicals, and by the Food and Drug Administration (FDA) for animal drugs and unavoidable contaminants. These limits are derived in most cases from the Code of Federal Regulations (CFR): pesticide limits from 40 CFR 180, those for animal drugs from 21 CFR 556, and unavoidable contaminants from 21 CFR 109. The approved use conditions for animal drugs can be found in 21 CFR 520, 522, 524, 526, 529 (new animal drugs not subject to certification), 540, 544, 546, 548 (antibiotic drugs for use with animals), and 558 (new animal drugs for use in animal feed).

Formal tolerances are not established in all cases. For example, tolerance exemptions have been granted by EPA and FDA in approving the use of some pesticides and new animal drugs. For some unavoidable contamination situations, EPA and FDA, upon request, recommend action levels to FSIS; however, tolerances or action levels have not been established for all such situations. FSIS permits concentrations of residues in meat and poultry that do not exceed the residue limits published in this section.

The residue limits for poultry and livestock species are listed alphabetically by compound (which may include a compound's metabolites). The entries include, among other things, CFR or Federal Register (FR) citations for tolerances, and notations of action levels. Entries for animal drugs with "zero" or "no residue" tolerances also include, in parenthesis, the limits of quantification determined by FSIS in applying the pertinent method. These limits are used by FDA for enforcement purposes, and are applied by FSIS in determining if product is adulterated.

Any residue of a new animal drug found in the edible tissues of a species for which the drug is not approved will be considered an adulterant, provided the residue is found at a concentration that can be quantified and confirmed by a validated analytical method. A concentration of a substance endogenous in the animal tissue in question would not be considered an adulterant.

Unless otherwise indicated, "meat byproducts" includes kidney and liver.

APPENDIX I: 1993 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
ANTIBIOTICS						
Chlortetracycline	21 CFR 556.150	0F ¹ 0.1K ¹ 0.1L ¹ 0.1M ¹	- 1K ² 0.5L ² 0.1M ²	0.2F 4K 2L 1M	1F 4K 1L 1M 1S	-
Erythromycin	21 CFR 556.230	0(0.3)Et ³	-	0.1Et	0.125Et	-
Gentamicin	21 CFR 556.300	-	-	0.4F 0.4K 0.3L 0.1M	0.1Et ⁴	-
Neomycin	21 CFR 556.430	0.25Et ⁵ 1.00F ⁶ 0.75K ⁶ 0.50L ⁶ 0.25M ⁶	- 1.25F ⁶ 1.25K ⁶ 1.25L ⁶ 0.25M ⁶	- 1.00F ⁶ 1.00K ⁶ 0.75L ⁶ 0.25M ⁶	- 0.50F ⁶ 1.00K ⁶ 0.75L ⁶ 0.25M ⁶	- 0.25M ⁶
Oxytetracycline	21 CFR 556.500	0.1Et	-	0.1Et	1F 3K 1L 1M 1S	-
Penicillin	21 CFR 556.510	0.05Et	0(0.04)Et ³	0(0.04)Et ³	0(0.04)Et ^{3,7}	-
Streptomycin	21 CFR 556.610	- ⁸	-	0(0.5)Et ³	0(0.5)Et ³	-
Tetracycline	21 CFR 556.720	0.25Et ⁹	0.25Et	0.25Et	0.25Et	-

KEY

1 Cattle only; calves 1F, 4K, 4L, 1M.

2 Sheep only.

3 Numbers in parenthesis are minimum levels of detection.

4 Turkeys only.

5 Calves only.

6 Action level (letter from J. Taylor of FDA to L. Crawford of FSIS, January 26, 1988).

7 Chickens, pheasants, and quail; turkeys 0.01Et; ducks and geese 0.01Et (action level).

8 Administrative tolerance 2.0K.

9 Calves only.

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

APPENDIX I: 1993 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
ANTIBIOTICS, continued						
Tylosin	21 CFR 556.740	0.2F	-	0.2F	0.2F	-
		0.2K		0.2K	0.2K	
		0.2L		0.2L	0.2L	
		0.2M		0.2M	0.2M	
SULFONAMIDES						
Sulfachlorpyridazine	21 CFR 556.630	0.1Et ²	-	0.1Et	-	-
Sulfadimethoxine	21 CFR 556.640	0.1Et	-	-	0.1Et	-
Sulfamethazine	21 CFR 556.670	0.1Et	-	0.1Et	0.1Et ¹	-
Sulfathiazole	21 CFR 556.690	-	-	0.1Et	-	-
ARSENICALS	21 CFR 556.60	0.7F ^{3,4,5}	-	2K	0.5M	0.7F ^{3,5}
	40 CFR 180.335	2.7K ^{3,5,6}		2L	2Mb	2.7K ^{3,5}
	40 CFR 180.311	2.7L ^{3,5,6}				2.7L ^{3,5}
		0.7M ^{3,4,5}		0.5M		0.7M ^{3,5}
		0.7Mb ^{3,4,5}		0.5Mb		0.7Mb ^{3,5}
CARBADOX and metabolite	21 CFR 556.100	-	-	0(0.030)Et ⁷	-	-

1 Chickens only.

2 Calves only.

3 Arsenite, sodium (40 CFR 180.335).

4 Cacodylic acid (40 CFR 180.311).

5 Tolerances expressed as As₂O₃.

6 Cacodylic acid 1.4 K, 1.4L.

7 Numbers in parenthesis are minimum levels of detection.

KEY

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

APPENDIX I: 1993 RESIDUE LIMITS

CHLORINATED HYDROCARBONS & ORGANOPHOSPHATES (CHC/COP'S)

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
			Units are parts per million			
Aldrin ¹	51 FR 46662	0.3F	0.3F	0.3F	0.3F	0.3F
Benzene Hexachloride ¹ (BHC)	51 FR 25697	0.3F	0.3F	0.3F	0.3F	0.3F
Carbophenothion	40 CFR 180.156	0.1F	0.1F	0.1F	-	-
Chlordane ²	51 FR 46665	0.3F	0.3F	0.3F	0.3F	0.3F
2-Chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate [chlorfenvinphos]	40 CFR 180.322	0.2F	0.2F ³	0.005F	0.005F	0.005F
2-Chloro-1-(2, 4, 5-tri- chlorophenyl)vinyl dimethyl phosphate [stirofos]	40 CFR 180.252	1.5F	0.5F	1.5F	0.75F	0.5F
Chlorpyrifos and metabolite	40 CFR 180.342	2.0F	1.0F	0.5F	0.5F	1.0F
		2.0M	1.0M	0.5M	0.5M	1.0M
		2.0Mb	1.0Mb	0.5Mb	0.5Mb	1.0Mb
Coumaphos and oxygen analog	40 CFR 180.189	1F	1F	1F	1F	1F
		1M	1M	1M	1M	1M
		1Mb	1Mb	1Mb	1Mb	1Mb
DDT and metabolites ¹	51 FR 46658	5F	5F	5F	5F	5F
Dieldrin ¹	51 FR 46662	0.3F	0.3F	0.3F	0.3F	0.3F
Dodecachloroocta- ¹ hydro-1, 3, 4-metheno- 2H-cyclo-buta(cd) pentalene [Mirex]	51 FR 45114	0.1F	0.1F	0.1F	0.1F	0.1F
		0.1M	0.1M	0.1M	0.1M	0.1M
		0.1Mb	0.1Mb	0.1Mb	0.1Mb	0.1Mb
Endosulfan and metabolite	40 CFR 180.182	0.2F	0.2F	0.2F	-	0.2F
		0.2M	0.2M	0.2M		0.2M
		0.2Mb	0.2Mb	0.2Mb		0.2Mb

KEY

1 Action level.

2 Action level; includes sum of residues of cis- and trans-chlordane, cis- and trans-nonachlor, oxychlordane (octachlor epoxide), and alpha, beta, and gamma chlordene.

3 Sheep only; goats 0.005F.

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

APPENDIX I: 1993 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
Units are parts per million						
CHC/COP'S, continued						
Endrin ¹	MPI Dir 917.1	0.3F	0.3F	0.3F	0.3F	0.3F
Hexachlorobenzene ¹ (HCB)	MPI Dir 917.1	0.5F	0.5F1	0.5F	0.5F	0.5F
Heptachlor and ¹ heptachlor epoxide	54 FR 33690 MPI Dir 917.1	0.2F	0.2F	0.2F	0.2F	0.2F
		0.2M	0.2M	0.2M	0.2M	0.2M
		0.2Mb	0.2Mb	0.2Mb	0.2Mb	0.2Mb
Lindane	40 CFR 180.133 MPI Dir. 917.1	7F	7F	4F	4F ¹	7F
Linuron	40 CFR 180.184	1F	1F	1F	-	1F
		1M	1M	1M	-	1M
		1Mb	1Mb	1Mb	-	1Mb
Methoxychlor	40 CFR 180.120 MPI Dir. 917.1	3F	3F	3F	3F ¹	3F
Polychlorinated ² biphenyls (PCB's)	21 CFR 109.30 46 FR 39224	3F ¹	3F ¹	3F ¹	3F	3F ¹
Phosalone	40 CFR 180.263	0.25F	0.25F	0.25F	-	0.25F
		0.25M	0.25M	0.25M		0.25M
		0.25Mb	0.25Mb	0.25Mb		0.25Mb
Ronnel and metabolites	40 CFR 180.177	10F	10F	3F	0.01F	-
		4M	4M	2M	0.01M	
		4Mb	4Mb	2Mb	0.01Mb	
Toxaphene	40 CFR 180.138 MPI Dir. 917.1	7F	7F	7F	7F ¹	7F
HALOFUGINONE	21 CFR 556.308	-	-	-	0.16L ³ 0.13L ³	-

KEY

1 Action level.

2 The temporary tolerance for unavoidable residues of PCB's in infant and junior foods is 0.2 ppm. The temporary tolerance in poultry (fat basis) is 3 ppm. [21 CFR 109.30(a)(3,8)].

3 Broiler chickens and turkeys respectively; tolerance for parent halofuginone; corresponds to 0.3 ppm total residues in liver.

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

APPENDIX I: 1993 RESIDUE LIMITS

Compound	Reference	Cattle	Sheep/ Goats	Swine	Poultry	Horses
Units are parts per million						
IVERMECTIN	21 CFR 556.344	15L ¹	30L ²	20L ³	-	-
LEVAMISOLE	21 CFR 556.350	0.1Et	0.1Et ⁴	0.1Et	-	-
MORANTEL TARTRATE	21 CFR 556.425	0.7L ⁵	-	-	-	-

KEY

1 Tolerance in ppb for 22, 23 dihydroavermectin B1a; corresponds to 50 ppb total residues in liver.

2 Sheep only; tolerance in ppb for 22, 23 dihydroavermectin B1a; corresponds to 125 ppb total residues in liver.

3 Tolerance in ppb for 22, 23-dihydroavermectin B1a; corresponds to 75 ppb total residues in liver.

4 Sheep only.

5 Tolerance for marker residue N-methyl-1,3, propanediamine (MAPA); corresponds to 2.4 ppm total residue in liver.

Ek:Excluding kidneys

Et:Edible tissue

F:Fat

K:Kidney

L:Liver

M:Muscle

Mb:Meat byproducts

S:Skin

Sf:Skin with fat

Sm:Skeletal muscle

APPENDIX II

APPENDIX II: 1993 DOMESTIC RESIDUE PROGRAM RESULTS - NON-VIOLATIVE LABORATORY-CONFIRMED POSITIVE RESULTS

ANTIBIOTICS

Monitoring: Analyses/Positives

Horses 309/2	Bulls 350/0	Beef cows 671/0	Dairy cows 260/0	Heifers 344/0
Steers 333/0	Bob calves 489/1	Formula-fed calves 537/5		Non-formula calves 303/2
Heavy calves 308/0	Sheep 291/0	Lambs 351/0	Goats 318/1	Market hogs 322/7
Boars/Stags 444/1	Sows 532/1	Young chickens 489/0	Mature chickens 498/0	
Young turkeys 520/3	Mature turkeys 246/3		Ducks 356/7	Geese 3/0
Total	8,274/33			

Individual Enforcement Testing: Analyses/Positives [includes STOP samples tested for sulfonamides also]

Horses 814/1	Cattle 112,888/396	Sheep/Lambs 1,666/0	Goats 128/0	
Swine 5,700/50	Chickens 22/0	Turkeys 22/3		Ducks 10/3
Total	121,250/453			

SULFONAMIDES

Monitoring: Analyses/Positives

Horses 306/0	Bulls 350/2	Beef cows 672/2	Dairy cows 261/0	Heifers 348/0
Steers 338/0	Bob calves 489/1	Formula-fed calves 537/4		Non-formula calves 300/2
Heavy calves 309/1	Sheep 292/0	Lambs 351/0	Goats 317/0	
Market hogs 322/3		Boars/Stags 442/7		Sows 532/5

APPENDIX II: 1993 DOMESTIC RESIDUE PROGRAM RESULTS - NON-VIOLATIVE LABORATORY-CONFIRMED POSITIVE RESULTS

SULFONAMIDES, continued

Young chickens 487/1	Mature chickens 491/0	Young turkeys 524/4	Mature turkeys 243/1
Ducks 353/0	Geese 3/0		
Total	8,267/33		
Individual Enforcement Testing: Analyses/Positives			
Horses 2/0	Cattle 47/5	Goats 5/0	Swine 157,561/211
Chickens 3/0	Turkeys 19/2	Ducks 3/0	
Total	157,640/218		

ARSENIC

Monitoring: Analyses/Positives

Goats 26/0	Market hogs 319/129	Boars/Stags 263/127	Sows 328/148	Young chickens 305/282
Mature chickens 306/139		Young turkeys 312/192		Mature turkeys 152/89
Total	2,011/1,106			
Individual Enforcement Testing: Analyses/Positives				
Swine 4/3	Chickens 23/23	Turkeys 1/1		
Total	28/27			

CHLORINATED HYDROCARBONS & ORGANOPHOSPHATES (CHC/COP'S)

Monitoring: Analyses/Positives

Horses 425/56	Bulls 555/44	Beef cows 651/56	Dairy cows 272/53	Heifers 546/27
Steers 523/33	Formula-fed calves 529/5	Non-formula calves 458/23	Heavy calves 498/88	
Sheep 470/52	Lambs 574/86	Goats 533/38	Market hogs 499/16	
Boars/Stags 452/19	Sows 537/33	Young chickens 498/3	Mature chickens 458/13	
Young turkeys 519/13	Mature turkeys 228/7	Ducks 322/7	Geese 3/0	
Total	9,550/672			

Individual Enforcement Testing: Analyses/Positives

Horses 81/16	Cattle 57/30	Sheep/Lambs 7/3	Goats 14/0
Swine 28/2	Chickens 11/1	Geese 18/6	
Total	216/58		

HALOFUGINONE

Monitoring: Analyses/Positives

Young chickens 311/2	Young turkeys 321/0
Total 632/2	

Individual Enforcement Testing: Analyses/Positives

Chickens 20/0
Total 20/0

APPENDIX II: 1993 DOMESTIC RESIDUE PROGRAM RESULTS - NON-VIOLATIVE LABORATORY-CONFIRMED POSITIVE RESULTS

IVERMECTIN

Monitoring: Analyses/Positives

Beef cows 405/1	Dairy cows 161/1	Heifers 339/0	Steers 332/1
Formula-fed calves 338/7	Non-formula calves 289/5	Heavy calves 312/2	
Sheep 282/1	Goats 312/0	Market hogs 318/0	Boar/Stags 267/0 Sows 324/1
Total	3,679/19		

Individual Enforcement Testing: Analyses/Positives

Cattle 13/0	Goats 1/0	Swine 1/0
Total	15/0	

LEVAMISOLE

Monitoring: Analyses/Positives

Bulls 354/0	Beef cows 406/0	Dairy cows 177/0	Heifers 335/0	Steers 340/0
Formula-fed calves 343/0		Heavy calves 305/0	Sheep 304/0	Lambs 361/0
Goats 308/0	Market hogs 328/0	Boars/Stags 268/0	Sows 339/0	
Total	4,168/0			

Individual Enforcement Testing: Analyses/Positives

Cattle 1/0
Total
1/0

APPENDIX II: 1993 DOMESTIC RESIDUE PROGRAM RESULTS - NON-VIOLATIVE LABORATORY-CONFIRMED POSITIVE RESULTS

MELENGESTROL ACETATE (MGA)

Individual Enforcement Testing: Analyses/Positives

Cattle 19/1 Sheep/Lambs 3/0

Total 22/1

MORANTEL TARTRATE

Monitoring: Analyses/Positives

Bulls 362/0 Beef cows 406/0 Dairy cows 163/0 Heifers 340/0 Steers 331/0

Formula-fed calves 343/0 Non-formula calves 290/0 Heavy calves 312/0

Total 2,547/0

APPENDIX II: 1993 DOMESTIC RESIDUE PROGRAM RESULTS - NON-VIOLATIVE LABORATORY-CONFIRMED POSITIVE RESULTS

CUMULATIVE TOTAL

Monitoring: Analyses/Positives

Horses 1,040/58	Bulls 1,971/46	Beef cows 3,211/59	Dairy cows 1,294/54
Heifers 2,252/27	Steers 2,197/34	Bob calves 978/2	Formula-fed calves 2,627/21
Non-formula calves 1,640/32		Heavy calves 2,044/91	Sheep 1,639/53
Lambs 1,637/86	Goats 1,814/39	Market hogs 2,108/155	Boars/Stags 2,136/154
Sows 2,592/188	Young chickens 2,090/288		Mature chickens 1,753/152
Young turkeys 2,196/212		Mature turkeys 869/100	Ducks 1,031/14
Geese 9/0			
Total	39,128/1,865		
Individual Enforcement Testing: Analyses/Positives			
Horses 897/17	Cattle 113,025/432	Sheep/Lambs 1,676/3	Goats 148/0
Swine 163,294/266	Chickens 79/24	Turkeys 42/6	Ducks 13/3
			Geese 18/6
Total	279,192/757		

APPENDIX III

APPENDIX III: 1993 VOLUNTARY INSPECTION AND CERTIFICATION PROGRAM FOR RABBITS

Monitoring: Analyses/Violations

Antibiotics 94/1

Chlorinated Hydrocarbons and Organophosphates (CHC/COP'S) 84/0

Sulfonamides 93/0

TOTAL 271/1

SPECIFIC VIOLATIVE RESIDUE

1 Streptomycin

Individual Enforcement Testing: Analyses/Violations

Antibiotics 13/0

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